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THE UNIVERSITY OF WISCONSIN-MILWAUKEE / MILWAUKEE, WISCONSIN 53201

DEPARTMENT OF CHEMISTRY
PHONE: (414) 963-4411

14 November 1973

In Depth Study of Catalytic Systems

*follow up to Aug. 30, '73 report.
Comment if desired*

Ray

Professor O. V. Krylov
Deputy Director
Institute of Physical Chemistry
USSR Academy of Science
Moscow, USSR

Dear Professor Krylov:

I must apologize for the lengthy delay since my last letter to you of September 12, 1973. However, I had hoped to receive a response from either Dr. Sklyarov or Dr. Alchazov before making my final proposal to you. Since I feel we must now proceed with the final arrangements, I will present my suggestions for your comments.

We have completed the preparation of the alpha and gamma forms of bismuth molybdate. They have been characterized by X-ray diffraction and their surface areas are being determined. In addition, elemental analysis will be obtained in order to complete the characterization. I am prepared to send you samples of these catalysts, along with the results of the characterization. Moreover, I will place a portion of the catalysts in the catalyst bank. I propose that on the samples of nickel, cobalt, iron; magnesium and aluminum molybdates which you will place in the catalyst bank, you also provide X-ray data, surface area data and elemental composition data.

After our discussions in Moscow, I felt both of us were in general agreement as to the overall research program in catalytic oxidation. Furthermore, both of our programs are of such a nature that we are studying the oxidation reaction from a variety of viewpoints. I do not anticipate any difficulty in accommodating a Russian scientist into my research program, nor do I feel you would have any difficulty in utilizing one of my post doctoral fellows that I send to you. I would hope that we could begin the exchange of scientists within a few months, and I will wait to receive further details from you.

In addition to the exchange of catalyst samples which we have agreed upon in our working document, I would like to suggest the following in terms of our exchange of scientists:

1. The scientist whom I propose to send to work in your group will have a strong background in kinetics and adsorption phenomena in general. I would propose that he utilize either the technique of Mossbauer spectroscopy or ESCA for the characterization of catalysts which he will bring with him, or some that are of interest to you.

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We recently have been devoting the major portion of our research effort to the study of iron containing catalysts, and as you recall, I left one of our samples with Dr. Margolis when I visited her in Moscow. I would think the application of Mossbauer spectroscopy would be extremely useful in characterizing these catalysts with respect to the oxidation state of the iron in the samples. We now have completed an X-ray study of these samples, and Mossbauer data would complement the X-ray data quite nicely. Of course, the use of ESCA would also be very helpful in an attempt to characterize these catalysts.

2. I would be pleased to accept someone from your research group to assist me in our oxidation work. I propose to utilize your scientist to conduct mechanistic studies utilizing isotopic tracers, either oxygen 18 or deuterium. I think you are familiar with the approach I have used with isotopic oxygen in an attempt to characterize the mobility of lattice oxygen, so I will not go into further detail in this letter. Another possibility which was proposed to me by Dr. Alchazov and which I agree with, is the study of the oxidative dehydrogenation of deuterated butenes in an attempt to verify the allylic mechanism and characterize in some detail kinetic isotope effects. As Dr. Alchazov has suggested, as far as he knows no one has repeated the work of Adams and Jennings with deuterated butenes, and the results might be very interesting. I would very much be interested in studying this reaction on one of the catalysts in the catalyst bank, or with a catalyst you can provide, or one of our newer iron-containing catalysts.
3. I would like to personally spend two to four weeks working with you or Dr. Margolis, probably in May, 1974, or June, 1974. I would hope that we could use this time to discuss plans for the second year of our cooperation and to summarize in either the form of one or more papers, the results which we have obtained. I would plan to utilize this time to discuss with you in more detail my research program in oxidation, and hopefully be able to discuss with you in more detail your research program. I feel many of our ideas concerning catalytic oxidation are quite similar, and I would enthusiastically welcome the opportunity to discuss this area further with you.

If my proposal is acceptable to you, would you please so indicate by return mail. In order to initiate the exchange of catalysts and scientists, please provide me with details as to how much of the catalyst samples you would like to receive and in what type of containers. I would also appreciate learning of the name of the individual who you would propose to send to my laboratory and an approximate date of his arrival. As far as my post doctoral fellow is concerned, I would like to know what would be a convenient starting date for him

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and some information concerning his housing arrangements, his salary in rubles, and the nature of his research program.

I shall be anxiously awaiting your reply, and I hope that you will have the opportunity to be visiting our laboratories in Milwaukee very soon.

Sincerely yours,

George W. Keulks
George W. Keulks
Chairman

GWK:ml

cc: W. K. Hall